REMARKS

Claims 1-23 were originally filed with this application. Claims 13-18 were previously withdrawn. Claims 2, 3, and 19-23 were previously canceled. Claims 1, 4-6, 9, 10, 25, and 28 are currently amended. Support for these amendments is provided in, for example, paragraphs [0007], [0009], [0014], [0027], [0053], and FIG. 1 of the application as published (U.S. Patent Pub. No. 2006/0261007 A1). Claims 12 and 29 are currently canceled without prejudice or disclaimer. As a result, claims 1, 4-11, and 24-28 are pending for examination with claims 1, 4, and 10 being independent claims. No new matter has been added.

Double Patenting

Claims 1-12 and 24-29 were provisionally rejected under the judicially created doctrine of obviousness-type double patenting over claims 1-4, 6, 7, 9-11, and 13-19 of co-pending Application No. 11/179,391, claims 1-18, 20-25, and 30 of co-pending Application No. 11/316,593, claims 1-10 of co-pending Application No. 11/574,819, claims 1-25 of co-pending Application No. 11/912,859, claims 15-40 of co-pending Application No. 10/569,565, claims 1-25 of co-pending Application No. 10/774,041, and claims 1-11 of co-pending Application No. 10/572,971.

It is noted that claims 12 and 29 are currently canceled, rendering the provisional rejection of these claims moot.

Applicants respectfully disagree that any of claims 1-11 and 24-28 of the instant application should be rejected on the ground of obviousness-type double patenting. Notwithstanding this traversal, Applicants will submit a terminal disclaimer with respect to the cited co-pending applications once the instant claims are deemed allowable and should these claims as allowed be obvious over the cited claims of the cited co-pending applications.

Rejections Under 35 U.S.C. § 102

Claims 1, 4, 5, 9, and 24-27 were rejected under 35 U.S.C. § 102(b) as being anticipated by, or in the alternative, under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 5,403,479 to Smith et al. (hereinafter "Smith").

Smith does not disclose each and every element of either of amended independent claims 1 or 4, and thus cannot anticipate these claims.

For example, Smith does not disclose backwashing by applying a gas to a liquid permeate wherein the gas does not penetrate into the membrane pores, as is recited in independent claims 1 and 4. Rather, when a gas is used as a biocide in Smith the gas must "diffuse through the pores of the membrane and chemically react with the foulant [on the outside of the membranes] to remove it." (Smith at Col. 12, lines 19-22.)

Smith does not disclose discharging backwash waste from the vessel as recited in independent claim 1. Rather, Smith discloses that "there is no need to counteract or recover the cleaning fluid which diffuses into the feed since that amount is too small to be objectionable . . . and is biooxidized at that low concentration, negating biocide build-up." (Smith at Col. 6, lines 29-34.)

Smith nowhere discloses venting the gas applied to liquid permeate as recited in independent claim 1. The gasses that Smith discloses that may be introduced into the filtration system disclosed are biocidal gasses such as sulphur dioxide, chlorine, fluorine, ethylene oxide, or the like. (Smith at Col. 12, lines 19-25.) Smith does not disclose what is done with these gasses once used for cleaning the disclosed membrane fibers. It would not be obvious, however, to vent these gasses from the system because these gasses are toxic.

Smith fails to disclose directing liquid permeate into the membrane module through a first end of the membrane module and through a second end of the membrane module as recited in independent claims 1 and 4. In contrast, Smith discloses that a cleaning solution is introduced into one end of the membrane fibers and removed from a second end. (Smith at Col. 17, lines 32-56.)

Smith nowhere discloses aerating membranes of the disclosed filtration system as recited in independent claim 1.

Smith does not disclose a method of backwashing a membrane filtration system comprising "isolating the lumens of the membranes, the manifold, the portion of the piping, and a gas inlet [of a filtration system] when [a] filtration process is stopped, the lumens of the membranes, the manifold, and the portion of piping upstream of the valve during filtration, wherein the lumens of the membranes, the manifold, and the portion of

piping consist of those through which permeate is withdrawn while filtering the feed liquid" as recited in independent claim 1 or "isolating the lumens, the manifold, a gas inlet, and a portion of piping [of a filtration system] when [a] filtration process is suspended, the lumens, the manifold, and the portion of piping upstream of the valve during filtration, wherein the lumens, the manifold, and the portion of piping consist of those through which permeate is withdrawn" as recited in independent claim 4. Rather, when the filtration system of Smith is backwashed, valve 25 is opened, which puts permeate withdrawal conduit 17 in fluid communication with conduit 21, through which cleaning solution is introduced and through which permeate is not withdrawn. Thus, a gas inlet and the membrane lumens, a manifold of the system, and a portion of piping through which permeate is withdrawn during filtration are not isolated during the backwash process according to Smith

Contrary to what is asserted in the Office Action, Smith does not disclose backwashing a membrane filtration system with permeate at Col. 11, lines 20-61, or anywhere else. Rather, Smith discloses backwashing the membranes with a biocidal cleaning solution. This biocidal cleaning solution does not consist of permeate. (Smith at Col. 11, lines 22-29; Col. 14, line 41 – Col. 15, line 15.)

Further, contrary to what is asserted in paragraph 1 of the Office Action, in the case that gas is used for a back flush there would not necessarily "be residual permeate in the hollow fiber lumens as well as the header and piping when the permeate side is switched to admit the gas." The existence of permeate remaining in, for example, the header and/or lumens of the system disclosed in Smith upon application of a back flushing gas is nowhere disclosed in Smith. Nor is it obvious that permeate would be present in the header and/or lumens upon application of the back flushing gas. One of ordinary skill in the art would have believed that Smith would have drained permeate from the header and/or piping and/or lumens before applying a back flushing gas to the membrane modules. It would have been advantageous to do so in order to increase the amount of permeate formed between back flushing cycles, thus increasing the efficiency of the system. Smith discloses that "back-flushing with permeate recycles it at the expense of permeate production and can only be justified when the cleaning effect of back-flushing is great enough to overcome the economic disadvantage." (Smith at Col.

9, lines 23-27.) Indeed, Smith discloses that in a pilot test plant utilizing his method, permeate in the membrane lumens is drained to permeate storage prior to the piping being configured for circulation of a biocidal solution. (Smith at Col. 20, lines4-8.)

Further, if liquid permeate were present in the header and/or lumens upon the application of the biocidal back flushing gas, some of the biocidal back flushing gas could dissolve in the permeate allegedly remaining in the header and/or lumens. This would be undesirable as the permeate would then carry the dissolved gas through the hollow fiber membranes and into the reservoir in which the membranes are immersed where it could kill beneficial microbes – a result that would be undesirable in the method of Smith.

As such, independent claims 1 and 4, which recite that the permeate used for backwashing consists of permeate present in the membrane lumens and manifold of a filtration system upon the suspension of a filtration process further patentably distinguish over Smith.

Because Smith does not disclose, teach, or suggest each and every element recited in independent claims 1or 4, independent claims 1 and 4 cannot be anticipated by Smith or obvious over Smith. Accordingly, reconsideration and withdrawal of the rejection of independent claims 1 and 4 under 35 U.S.C. § 102 as anticipated by Smith, or in the alternative, under 35 U.S.C. § 103 as obvious Smith is respectfully requested.

Dependent claims 5, 9, and 24-27 all depend either directly or indirectly from one of independent claims 1 or 4, and patently distinguish over Smith for at least the same reason as independent claims 1 and 4. Accordingly, reconsideration and withdrawal of the rejection of dependent claims 5, 9, and 24-27 under 35 U.S.C. § 102 as anticipated by Smith, or in the alternative, under 35 U.S.C. § 103 as obvious Smith is respectfully requested.

Rejections Under 35 U.S.C. § 103

Claims 1, 4-12 and 24-29 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the combination of Smith and/or U.S. Patent No. 5,209,852 to Sunaoka et al. (hereinafter "Sunaoka") and/or U.S. Patent No. 5,643,455 to Kopp et al.

(hereinafter "Kopp") and/or U.S. Patent Publication No. 2001/0052494 to Cote et al. (hereinafter "Cote").

It is noted that claims 12 and 29 are currently canceled, rendering the rejection of these claims moot.

There is no *prima facie* case of obviousness of claims 1-11 and 24-28 over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or Cote. The asserted combination fails to teach or render obvious each and every element of any of independent claims 1, 4, and 10 or the claims that depend therefrom.

None of Smith nor Sunaoka, Kopp, or Cote disclose, teach, or suggest a method of backwashing a membrane filtration system comprising isolating the lumens, the manifold, and a gas inlet of a filtration system when a filtration process is suspended, the lumens and the manifold downstream of a valve, the valve in direct fluid communication with the lumens, wherein the lumens, the manifold, and the valve consist of those through which permeate is withdrawn as is recited in independent claims 1 and 4. The method recited in independent claim 10 is fundamentally different from and would require fundamentally different equipment and operating methods from the equipment and methods disclosed in any of Smith, Sunaoka, Kopp, or Cote.

Smith fails to disclose each and every claim element of independent claims 1, 4, and 10

The reasons why Smith does not teach or render obvious each and every claim element of independent claims 1 and 4 is discussed above.

Independent claim 10 patentably distinguishes over Smith because it recites an inside-out filtration system. In contrast, all embodiments of the filtration device disclosed in Smith rely on outside-in filtration. In contrast to what is asserted in the Office Action, it is not obvious that the system of Smith could be operated as an inside-out filtration system. There is no suggestion in Smith that a membrane bioreactor such as disclosed in Smith could be operated in an inside-out filtration mode. One of ordinary skill in the art would not be motivated to attempt to operate a membrane bioreactor in an inside-out filtration mode because biological solids present in the feed would clog the membrane lumens and halt the filtration process.

Sunaoka fails to disclose each and every claim element of independent claims 1, 4, and 10

Sunaoka fails to disclose applying a gas to a portion of liquid permeate at a pressure less than a bubble point of membranes of the membrane filtration system as is recited in independent claims 1, 4, and 10. Sunaoka does not disclose any particular pressure for the compressed air applied to the filtrate to effect backwash. (Sunaoka at Col. 10, lines 58-64.) Sunaoka thus also fails to disclose that the gas is applied at a pressure such that it does not penetrate into the membrane pores, as is recited in independent claims 1, 4, and 10. One of ordinary skill in the art would have believed that the compressed air utilized by Sunaoka was compressed to a high pressure, e.g. above the bubble point of the membranes, to provide a significant force to remove particles from the membrane pores during backwashing.

Sunaoka fails to disclose "directing the portion of liquid permeate into the membrane module through a first end of the membrane module and a through second end of the membrane module" as recited in independent claim 1 or "directing liquid permeate present in the isolated manifold and portion of piping into the lumens through a first end of the filtration membranes and through a second end of the filtration membranes" as recited in independent claim 4. Rather, Sunaoka discloses only that filtrate is introduced from compartment F into an upper end of the membrane modules.

Sunaoka fails to disclose venting gas used to displace at least some of the backwashing liquid through pores in walls of the membranes as recited in independent claim 1. Sunaoka discloses no method or structure for venting the compressed air from inside the upper compartment F into which it is introduced.

Sunaoka fails to disclose utilizing permeate present in any piping of the filtration system when a filtration process is stopped for backwashing as is recited in independent claims 1 and 4. Sunaoka also fails to disclose utilizing permeate present in a shell side of a pressure vessel of a filtration system when a filtration process is stopped for backwashing as is recited in independent claim 10. Rather, Sunaoka discloses that "compressed air may be charged into the upper compartment F via the compressed air charge piping . . . to flow filtrate present inside the upper compartment F backward from the insides of the hollow fibers." (Sunaoka at Col. 10, lines 59-64.) Compartment F is

neither a portion of piping of the filtration system of Sunaoka nor a shell side of a pressure vessel.

Independent claim 10 recites an inside-out filtration system. In contrast, all embodiments of the filtration device disclosed in Sunaoka rely on outside-in filtration.

Kopp fails to disclose each and every claim element of independent claims 1, 4, and 10

Kopp fails to disclose "directing the portion of liquid permeate into the membrane module through a first end of the membrane module and through a second end of the membrane module" as recited in independent claim 1 or "directing liquid permeate present in the isolated manifold and portion of piping into the lumens through a first end of the filtration membranes and through a second end of the filtration membranes" as recited in independent claim 4. Rather, Kopp discloses only that air is used to push filtrate through fiber membranes through an upper end of the membrane modules through air valve 112 and chamber 105.

Kopp further fails to disclose "scouring surfaces of the membranes by flowing bubbles of a first gas past surfaces of the membranes" as recited in independent claim 1.

Kopp fails to disclose a backwash method in which gas does not penetrate into the membrane pores as is recited in independent claims 1, 4, and 10. Rather, Kopp discloses a two stage backwashing process, the second stage of which includes "caus[ing] high pressure air from process air supply 33 to enter the lumens of the fibre bundle 13, pass through the walls thereof and into the interior of shell 12." (Kopp at Col. 9, lines 45-52.) One of ordinary skill in the art would not have found it obvious to perform the method of backwashing of Kopp without this second stage, as this would have reduced the efficacy of the backwashing process according to Kopp. ("admission to the hollow fibre lumens of gas at a pressure substantially higher than the bubble point of the pores . . . provide[s] effective cleaning and scouring even at the most distant point from the lumen inlet thus reducing the natural tendency in a liquid only reverse flow backwash towards preferential washing of pores near the lumen inlet." Kopp at Col. 3, lines 31-39.)

Kopp fails to disclose a method of backwashing a membrane filtration system comprising isolating the lumens of the membranes, the manifold, the portion of the

piping, and a gas inlet of a filtration system when a filtration process is stopped, the lumens of the membranes, the manifold, and the portion of piping upstream of the valve during filtration, wherein the lumens of the membranes, the manifold, and the portion of piping consist of those through which permeate is withdrawn while filtering the feed liquid as is recited in independent claims 1 and 4. Rather, when the filtration process of Kopp is stopped, valve 106 is closed, but the membrane lumens and the piping between valve 106 and the membrane lumens is not isolated from the piping leading to air outlet valve 116. (Kopp FIG. 13; Col. 11, lines 45-52.) Thus, a gas inlet and the membrane lumens, a manifold of the system, and a portion of piping through which permeate is withdrawn during filtration are not isolated during the backwash process according to Kopp.

Independent claim 10 recites an inside-out filtration system. In contrast, all embodiments of the filtration device disclosed in Kopp rely on outside-in filtration.

Cote fails to disclose each and every claim element of independent claims 1, 4, and 10

Cote fails to disclose backwashing by applying a gas to liquid permeate as recited in independent claims 1, 4, and 10. Rather, Cote discloses that a pump 32 is used to push filtered permeate 36 from a storage tank 62 through a backwash pipe 63 to membrane headers 26 and through the walls of the membranes 24 in a reverse direction (Cote at Paragraph [0025]). As such, Cote also cannot disclose applying a gas at a pressure below a bubble point of the membrane modules to liquid permeate as is recited in independent claims 1, 4, and 10. Nor can Cote disclose venting gas applied to the permeate from the system as is recited in independent claim 1 as there is no gas applied to the permeate at all in the method of Cote.

Cote fails to disclose directing liquid permeate present in isolated lumens, a manifold, and a portion of piping through which permeate is withdrawn during filtration into the membrane module as recited in independent claims 1 and 4. Rather, during backwash, permeate is directed through pipe 63 from permeate storage tank 62 to the membrane modules. The permeate in storage tank 62 is not permeate present in the isolated lumens, manifold, or portion of piping through which permeate is withdrawn during filtration. Nor is pipe 63 a manifold or a portion of piping through which

permeate is withdrawn from the system of Cote during filtration. The pipe 63 is only used for directing backwashing or chemical cleaning fluid to the membranes of Cote (Cote FIG. 1; paragraphs [0025] and [0028]-[0029]).

Cote fails to disclose a method of backwashing a membrane filtration system comprising isolating the lumens of the membranes, the manifold, the portion of the piping, and a gas inlet of a filtration system when a filtration process is stopped, wherein the lumens of the membranes, the manifold, and the portion of piping consist of those through which permeate is withdrawn while filtering the feed liquid as is recited in independent claims 1 and 4. Rather, when the permeate backwash of Cote is initiated, backwash valves 60 are opened. This puts permeate collector manifolds 30 in fluid communication with, among other things, backwash line 63, permeate pump 32, and permeate storage tank 62. Thus, a gas inlet and the membrane lumens, a manifold of the system, and a portion of piping through which permeate is withdrawn during filtration are not isolated during the backwash process according to Cote.

Independent claim 10 recites an inside-out filtration system. In contrast, all embodiments of the filtration device disclosed in Cote rely on outside-in filtration.

Independent claims 1, 4, and 10 are non-obvious over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or Cote

The asserted combination Smith and/or Sunaoka and/or Kopp and/or Cote could not teach or render obvious each and every claim element of independent claims 1, 4, or 10.

None of Smith, Sunaoka, Kopp, or Cote disclose or render obvious a method of backwashing a membrane filtration system with a gas applied to a liquid permeate formed during a filtration operation wherein the gas does not penetrate into pores of the membrane, as is recited in independent claims 1, 4, and 10.

Nor do any of Smith and/or Sunaoka and/or Kopp and/or Cote disclose or render obvious a method of backwashing a membrane filtration system comprising isolating the lumens of the membranes, the manifold, a portion of the piping, and a gas inlet of a filtration system when a filtration process is stopped, wherein the lumens of the membranes, the manifold, and the portion of piping consist of those through which

permeate is withdrawn while filtering the feed liquid, and applying a gas to a portion of liquid permeate present in the isolated lumens, manifold, and portion of piping as recited in independent claims 1 and 4.

As none of these references disclose or render obvious these elements of independent claims 1 and 4, no combination of these references could render these elements of independent claims 1 and 4 obvious.

Independent claim 10 is further non-obvious over the asserted combination of Smith and/or Sunaoka an/or Kopp and/or Cote because independent claim 10 recites a method comprising "applying [a] liquid suspension to lumens of filtration membranes" and "filtering the liquid suspension through pores in walls of the filtration membranes [to] form[] liquid permeate on a shell side of a pressure vessel in which the filtration membranes are mounted." This method is fundamentally different from and would require fundamentally different equipment and operating methodology than the equipment and methods disclosed in any of Smith, Sunaoka, Kopp, or Cote, all of which disclose systems used for filtering a liquid suspension located on the outside of hollow filter membranes to produce permeate within the lumens of the membranes. A proposed modification to a reference that fundamentally alters the nature or function of the subject of that reference is improper. (*See* MPEP § 2143.01 VI, "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959).")

Further, one of ordinary skill in the art would not have been motivated to have operated a membrane bioreactor, such as the system of Smith, in an inside-out filtration mode because biological solids present in the mixed liquor feed would clog the membrane lumens. Similarly, the iron oxide particles in the feed of Sunaoka would coat the inside of the membrane lumens, thereby clogging them. These particles would not be removable by the aeration process disclosed in Sunaoka. Further, the system of Cote is described as capable of filtering mixed liquor (Cote at paragraph [0019]). One of ordinary skill in the art would not have been motivated to use the system of Cote in an inside-out filtration mode because this would make the system inappropriate for use in

filtering mixed liquor as biological solids present in the mixed liquor feed would clog the membrane lumens.

One of ordinary skill in the art would not have been motivated to have combined Smith and/or Sunaoka and/or Kopp and/or Cote in the manner asserted

Any *prima facie* case of obviousness of claims 1-11 and 24-28 over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or Cote would fail because one of ordinary skill in the art would not have been motivated to have combined these references in the manner asserted.

These four references are directed to fundamentally different and discreet filtration systems and devices, each having specific objectives, structures, and methods of operation. In order to combine these references in such a way as to render obvious any of independent claims 1, 4, or 10, the Examiner would have to use hindsight reasoning as a roadmap to pick, choose, and combine various discreet elements of these four references. The Examiner has not provided a valid rationale as to why one of ordinary skill in the art would have combined Smith and/or Sunaoka and/or Kopp and/or Cote in the manner asserted. To the contrary, one of ordinary skill in the art would have been dissuaded from combining these references in the manner asserted for the reasons outlined below.

One of ordinary skill in the art would not have combined Smith with any of Sunaoka, Kopp, or Cote

Smith could not have been validly combined with any of Sunaoka and/or Kopp and/or Cote in the manner suggested to render obvious the subject matter of any of claims 1-11 and 24-28 because Smith teaches away from the use of permeate for backwashing hollow filter membranes as is taught by Sunaoka, Kopp, and Cote and as is recited in claims 1-11 and 24-28. Specifically, Smith states at Col. 9, lines 49-52 that "[i]t is not practical to back-flush fibers with permeate because the cleaning effect of permeate is solely due to hydraulic pressure and is therefore relatively ineffective." Thus, because Smith teaches away from the use of permeate for backwashing membrane filters, Smith could not have been validly combined with Sunaoka and/or Kopp and/or

Cote in the manner asserted to render obvious the subject matter recited in any of claims 1-11 or 24-28.

One of ordinary skill in the art would not have combined Smith with Sunaoka

One of ordinary skill in the art would not have been motivated to have combined the teachings of Sunaoka with those of Smith for the reason asserted in the Office Action or for any other. On pages 5-6 of the Office Action the Examiner asserts that one of skill in the art "would use the teachings of Smith for the backwashing steps in the teaching of Sunaoka because it is highly effective according to Smith." However, what is asserted in Smith is that the method disclosed is effective for cleaning a biofilm from the surfaces of membranes in a bioreactor using a biocidal solution without releasing a quantity of biocide into the membrane bioreactor that would kill a significant number of beneficial microbes. (Smith Abstract; Col. 11, lines 22-29.) There is no disclosure, teaching, or suggestion in either Smith or Sunaoka that the method of Smith would be effective in accomplishing the object of the method disclosed in Sunaoka – removing course, hard, fine particles from the surfaces of hollow fibers immersed in condensate water obtained in a nuclear or thermoelectric power plant or industrial waste water with permeate utilized as backwash fluid without roughening the outer surfaces of the fibers. (Sunaoka at Col. 1, lines 8-13; Col. 3, lines 23-33; Col. 10, lines 58-64.)

One of ordinary skill in the art would not have been motivated to have combined a portion of a method for cleaning a biofilm from membranes with a biocide without releasing significant biocide outside the membranes as disclosed in Smith with a portion of a method for removing course particles from a membrane solution without significantly damaging the surfaces of the membrane as disclosed in Sunaoka. The two methods have very different objectives and address very different concerns – Smith does not recognize an object of minimizing damage to membranes during cleaning and Sunaoka does not recognize an object of minimizing the amount of backwash liquid which permeates through the membrane pores.

One of ordinary skill in the art would not have combined Smith with Kopp or Cote

One of ordinary skill in the art would not have been motivated to have combined Smith with Kopp or with Cote. As discussed above, Smith teaches away from the use of permeate as a backwash fluid as is taught by Kopp and Cote. Further, one of ordinary skill in the art would not have been motivated to have combined the systems or methods of Smith with those of Kopp or Cote because the methods disclosed in these references operate in fundamentally different ways. The backwash process of Smith relies on a diffusive flow of either a biocidal liquid or gas provided at a pressure below the bubble point of hollow fiber membranes through pores of the membrane to dissolve a biofilm on the membranes without releasing a significant amount of biocide into the mixed liquor in the filtration vessel. (Smith at Col. 5, line 60-Col. 6, line 2; Col. 12, lines 20-22.) In contrast, the backwash methods of Kopp and Cote both rely on mechanical rather than chemical means for cleaning membrane pores. The backwash process of Kopp includes first draining the lumens of hollow filter membranes with the application of a gas at a low pressure and then applying gas at a high pressure, above the bubble point of the membranes to "cause[] high pressure air from process air supply 33 to enter the lumens of the fiber bundle 13, pass through the walls thereof, and into the interior of shell 12." (Kopp at Col. 9, lines 30-52.) The backwash process of Cote relies on using permeate pump 32 "to push filtered permeate 36 from storage tank 62 through a backwash pipe 63 to the headers 26 and through the walls of the membranes 24 in a reverse direction thus pushing away some of the solids attached to the membranes 24." (Cote at paragraph [0025].)

A backwash method involving the flow of gas or liquid through membrane pores above a bubble point of the membranes to physically remove contaminants from the membranes as in Kopp or Cote is fundamentally different than a backwash method involving backwashing with a biocide at a pressure below the bubble point of a fiber membrane which permeates the membrane pores by diffusive flow to chemically attack a biofilm on the membrane, as in Smith. As such, one of ordinary skill in the art would not have looked to either Kopp or Cote to modify Smith as this would require a fundamental change to the operating method of at least one of Kopp, Cote, or Smith.

Thus, Smith cannot be properly combined with either Kopp or Cote. (*See* MPEP § 2143.01 VI, quoted above.)

One of ordinary skill in the art would not have combined Sunaoka with Cote

One of ordinary skill in the art would not have been motivated to have combined Sunaoka with Cote. The backwashing method of Sunaoka relies on "compressed air . . . charged into the upper compartment F [of the filtration vessel] via the compressed air charge piping 15A . . . to flow filtrate present inside the upper compartment F backward from the insides of the hollow fibers 2 to the outsides thereof to effect backwash." (Sunaoka at Col. 10, lines 58-64.) In contrast, the backwash process of Cote relies on using permeate pump 32 "to push filtered permeate 36 from storage tank 62 through a backwash pipe 63 to the headers 26 [on both sides of the membranes] and through the walls of the membranes 24 in a reverse direction thus pushing away some of the solids attached to the membranes 24." (Cote at paragraph [0025].) To modify the filtration system of Sunaoka to perform the backwash process according to Cote would have required a significant change to the equipment and operation method of Sunaoka. For example, a filtrate storage tank, filtrate pump, valves and piping would have to be added and the system of Sunaoka and the mode of operation significantly modified to backwash the membranes of Sunaoka from both sides with permeate pumped from the permeate storage tank as in Cote. Similarly to modify the filtration system of Cote to perform the backwash process according to Sunaoka would have required a significant change to the equipment and operation method of Cote. For example, a gas supply and gas piping and valves would need to be added to the system of Cote and the headers 26 would need to be increased in size so as to function as a source of backwash fluid. One of skill in the art would not have been motivated to have made these modifications because they would have fundamentally altered the construction and operation of the system of either Sunaoka or Cote. (*See* MPEP § 2143.01 VI, quoted above.)

One of ordinary skill in the art would not have combined Kopp with Sunaoka or Cote

For similar reasons, one of ordinary skill in the art would not have been motivated to have combined Kopp with Sunaoka or with Cote. The backwash procedures and filtration systems disclosed in these references are significantly different. Kopp utilizes a two stage backwash process wherein gas at a low pressure first displaces permeate from within lumens of a filtration membrane and then gas at a higher pressure is passed through pores of the membranes. In both Sunaoka and Cote, permeate, not gas, is passed through the membrane pores. To perform the backwash method of Kopp on either the system of Sunaoka or that or Cote would have required significant modifications to these systems. For example, a gas supply and high and low pressure piping and valves would have had to be added to the system of Cote. High and low pressure valves and piping and a gas vent would have had to have been added to the system of Sunaoka. Further, the processes of Sunaoka and Cote would have had to have been modified to somehow re-wet the hollow fiber membranes once gas had displaced liquid from the membrane pores. One of ordinary skill in the art would also have not been motivated to have modified Kopp to perform the backwashing process of Sunaoka or Cote. Significant changes would have had to have been made to the system of Kopp and the process of Kopp modified, resulting in the benefits of the two step backwashing process disclosed in Kopp no longer being achieved. As such, one of skill in the art would not have been motivated to have made these modifications because they would have fundamentally altered the construction and operation of the system of either Kopp, Sunaoka, or Cote. (*See* MPEP § 2143.01 VI, quoted above.)

Accordingly, reconsideration and withdrawal of the rejection of independent claims 1, 4, and 10 under 35 U.S.C. § 103 as obvious over the combination of Smith and/or Sunaoka and/or Kopp and/or Cote is respectfully requested.

Dependent Claims

Dependent claims 24-28 all depend directly from independent claim 1 and are patentable over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or

Cote for at least the same reasons as independent claim 1. Dependent claims 5-9 and 11 depend either directly or indirectly from independent claim 4 and are patentable over the asserted combination of Smith and/or Sunaoka and/or Kopp and/or Cote for at least the same reasons as independent claim 4. Accordingly, reconsideration and withdrawal of the rejection of dependent claims 5-9, 11, and 24-28 under 35 U.S.C. § 103 as obvious over the combination of Smith and/or Sunaoka and/or Kopp and/or Cote is respectfully requested.

CONCLUSION

In view of the foregoing Amendments and Remarks, this application is in condition for allowance; a notice to this effect is respectfully requested. If the Examiner believes that the application is not in condition for allowance, the Examiner is requested to call Applicants' attorney at the telephone number listed below.

If this Response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby request any necessary extension of time. If there is a fee occasioned by this Response, including an extension fee that is not covered by an enclosed check please charge any deficiency to Deposit Account No. 50/2762.

Respectfully submitted,
Fufang Zha et al., Applicants

By: /Gregory Gerstenzang/
Gregory Gerstenzang, Reg. No. 59,513
Peter C. Lando, Reg. No. 34,654
LOWRIE, LANDO & ANASTASI, LLP
One Main Street
Cambridge, Massachusetts 02142
United States of America
Telephone: 617-395-7000
Facsimile: 617-395-7070

Docket No.: M2019-7033US
Memcor Ref. No.: IPD-C360-US
Date: May 4, 2009